R E M A R K S

Presently Claimed Invention

The presently claimed invention pertains to a sputtering target consisting essentially of a binary alloy including Cu and Mo in an amount of 0.1 to 3.0% by weight (see applicant's claim 2).

The presently claimed invention also relates to an electronic component having a wiring pattern, an electrode or a contact using a metallic material, said metallic material formed by a sputtering process using a sputtering target consisting essentially of a binary alloy including Cu and Mo in an amount of 0.1 to 3.0% by weight (see applicant's claim 9).

The presently claimed invention is also directed to an electronic device having a wiring pattern, an electrode or a contact using a metallic material, said metallic material formed by a sputtering process using a sputtering target consisting essentially of a binary alloy including Cu and Mo in an amount of 0.1 to 3.0% by weight (see applicant's claim 18).

The presently claimed invention also concerns an electronic optical component having reflective film, an electrode or a wiring pattern which are formed by a metallic film formed by a sputtering process using a sputtering target consisting essentially of a binary alloy including Cu and Mo in an amount of 0.1 to 3.0% by weight (see applicant's claim 45).

Obviousness Rejections under 35 USC 103

1. Claims 2, 9, 18 and 45 were rejected under 35 USC 103 as being unpatentable over USP 4,818,283 to Grunthaler et al.; Xiao et al., Scripta Mettalurgica et Materialia, Vol. 32, No. 3, pp. 353-358 (1995) or Chu et al., Journal of Applied Physics, Vol. 85, No. 9, 6462-6469 (1999) for the reasons set forth on pages 2 to 4 of the Office Action.

2. Claims 2, 9, 18 and 45 were rejected under 35 USC 103 as being unpatentable over the "acknowledged prior art admission" in view of USP 4,818,283 to Grunthaler et al., Xiao et al. or Chu et al. for the reasons beginning at the middle of page 4 and continuing to the top of page 5 of the Office Action.

It was admitted in the Office Action that the "acknowledged prior art admission" does not disclose a Cu-Mo alloy metallic contact.

Applicant's Rebuttal to the Obviousness Rejections

Applicant's claim 2 is directed to a sputtering target consisting of a binary alloy including Cu and Mo. A sputtering target is an origin material used in a sputtering process. The sputtering process is explained as follows.

A substrate is opposed to the sputtering target in a vacuum chamber. Gas is introduced in the vacuum chamber. The gas is made of a plasma between the sputtering target and the substrate by applying voltage. The sputtering target is beaten with ions which are generated at that time and are accelerated in an electric field. Elements of the sputtering target dash out by the sputtering target being beaten with the ions. The elements adhere to the surface of the substrate. A thin film is formed on the surface of the substrate by the sputtering process. The thickness of the thin film is extremely thin. It is hundreds of nanometers to several nanometers.

Therefore, when the sputtering target consists of the alloy, uniform dispersion of the additive element has a large influence on the properties of the thin film, such as resistivity and atmospheric corrosion resistance. The reason is that the alloy composition of the thin film is different from the alloy composition of the sputtering target if the additive element has not been uniformly dispersed. In other words, it is absolutely impossible to form a thick film that does not influence the properties, even if the additive element has not been uniformly dispersed in the sputtering target. Thus when the sputtering target is a binary alloy including Cu and Mo, it is necessary to have dispersed Mo in Cu extremely uniformly. If Mo is not uniformly dispersed in Cu, a person having ordinary skill in the art would know that the properties of the thin film worsen.

USP 4,818,283 (Grunthaler et al.) describes a process for producing a copper alloy which includes admixing to a copper melt from 0.3 to 15 weight % Mo to provide a mixture and superheating the mixture to a temperature ranging from about 200°C to about 1000°C above the melting point of copper to provide a superheated melt. However, Mo is not uniformly dispersed in the copper alloy

in USP 4,818,283. This is because the binary alloy including Cu and Mo is not a solid solution, and segregation of Mo exists in the copper alloy. Moreover, USP 4,818,283 does not mention a sputtering target.

It was asserted in the Office Action that "applicant fails to show the Cu-Mo electrode of USP '283 cannot be functioned as sputtering target."

In addition, the following was contended at the bottom of page 5 of the Office Action:

> "Applicant argues that in USP 4,818,283, Mo is not uniformly dispersed in the copper alloy. But, it is immaterial because dispersion distribution has not been recited or defined."

However, it is clear that the Cu-Mo electrode of USP 4,818,283 cannot function as sputtering target. The reasons for this are as follows: (i) a sputtering target is an origin material used by a sputtering process; (ii) a thin film is formed on the surface of the substrate by such sputtering process; (iii) the thickness of the thin film is extremely thin; and (iv) it is absolutely impossible to form a thick film that does not

influence the properties, even if an additive element has not been uniformly dispersed by using a sputtering target.

Applicant's present claim 2 and applicant's other claims are therefore submitted to be patentable over USP 4,818,283.

Chu et al. disclose the resistivity of thin film consisting of an alloy including Cu and Mo in an amount of 2 at% (2.98% by weight) (see FIG.11 on page 6467 of Chu et al.). However the resistivity of the thin film is a mistake, because FIG. 11 on page 6467 of Chu et al. shows that the resistivity of the thin film consisting of an alloy including Cu and Mo in an amount of 2 wt% (2.99% by weight) is lower than the resistivity of a thin film consisting of pure Cu. A person having ordinary skill in the art would know this would be impossible. Actually, the resistivity of a thin film consisting of an alloy including Cu and Mo in an amount of 2 wt% (2.98% by weight) is higher than the resistivity of a thin film consisting of pure Cu.

The reason for such a mistake in Chu et al. is that the target of Chu et al. involves co-sputtering with separate Cu and Mo targets. Chu et al. describe a sputtering target produced by attaching a Cu plate (99.9% pure) with a Mo target (99.95% pure).

In Chu et al., on page 6462, lines 1-4 of "Experimental Procedure," Mo would not be uniformly dispersed in a thin film formed with such co-sputtering target. The thin film partially contains pure Cu. The reason for this is due to the above-mentioned sputtering process.

The following is stated on page 6 of the Office Action:

> "Applicants argument with respect to Chu is noted. But, there is no resistivity/ conductivity recited in any rejected claims."

However, the allegation in the preceding paragraph is irrelevant for the following reasons. It is absolutely impossible to form a thick film that does not influence the properties, even if an additive element has not been uniformly dispersed by using a sputtering target. When the resistivity of a thin film formed by using a sputtering target, even if resistivity of the sputtering target is low, is high, it is clear that it is not functioning at all as a sputtering target. When the resistivity of a thin film formed by using a sputtering target and the resistivity of the sputtering target are almost the same, the functioning of such as a sputtering target is clear.

Therefore, it is respectfully submitted that applicant's present claim 2 and applicant's other claims are submitted to be patentable over Chu et al.

Xiao et al. describes a sputtering target which is produced by attaching pieces of pure Cu foil to a Mo target (see page 353, lines 1 to 5 of "Experimental Procedures"). This means Xiao et al. disclose a co-sputtering with separate Cu and Mo targets. Mo is not uniformly dispersed in the thin film formed with the co-sputtering target of Xiao et al. The thin film in Xiao et al. partially contains pure Cu. Therefore, the alloy sputtering target of applicant's claim 2 is substantially different from the co-sputtering target of Chu et al and Xiao et al.

Thus, applicant's claim 2 and applicant's other claims are submitted to be patentable over Xiao et al.

The following was stated near the bottom of page 5 of the Office Action:

> "Applicant argues that Xiao et al. and Chu et al. do not teach or suggest a wiring pattern electrode or a contact formed by a sputtering target consisting essentially of a binary alloy including Cu and Mo, as recited in applicant's claim 9. Further, a

> sputtering target consisting essentially of a binary alloy including cu and Mo, as recited in applicant's claim 9 produces a Cu-Mo alloy thin film with a stable composition compared to the co-sputtering of Xiao et al. and Chu et al. But it is immaterial because there is no thin film being claimed as a final product. An electrode or a contact reads on structures of any sputtered product."

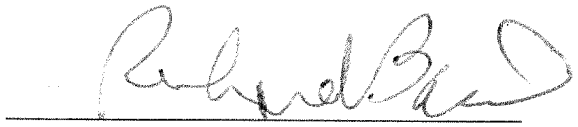
However, the Examiner's point in the preceding paragraph is irrelevant for the following reasons. A sputtering target is an origin material used by a sputtering process. A thin film is formed by using the sputtering process. It is absolutely impossible to form a thick film that does not influence the properties, even if the additive element is not uniformly dispersed by using the sputtering target. Thus, it is clear that a wiring pattern, an electrode or a contact of applicant's claim 9 includes a thin film.

Withdrawal of each of the 35 USC 103 rejections is thus respectfully requested.

Reconsideration is requested. Allowance is solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,



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